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FINAL

Confirmation Sampling and Analysis Plan for Building 406

Offutt Air Force Base
Nebraska

Prepared For

Air Force Center for Environmental Excellence
Brooks Air Force Base, Texas

and

55 CES/CEVR
Headquarters Air Combat Command (ACC)
Offutt AFB, Nebraska

October 1997

PARSONS
PARSONS ENGINEERING SCIENCE, INC.
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FINAL
CONFIRMATION SAMPLING AND ANALYSIS PLAN
FOR BUILDING 406
OFFUTT AIR FORCE BASE, NEBRASKA

October 1997

Prepared for:

Air Force Center for Environmental Excellence
Brooks AFB, Texas
and

Headquarters 55th Air Combat Command (ACC)
Offutt AFB, Nebraska

Prepared by:
Parsons Engineering Science, Inc.
1700 Broadway, Suite 900
Denver, Colorado 80290

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LIST OF ACRONYMS AND ABBREVIATIONS

AFCEE	Air Force Center for Environmental Excellence
AFB	Air Force base
ASTM	American Society for Testing and Materials
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CES/CEVR	Civil Engineering Squadron/Environmental Division
COPC	chemical of potential concern
ES	Engineering-Science, Inc.
IDW	investigation-derived waste
JP-4	jet propulsion grade 4 [fuel]
MCL	maximum contaminant limit
µg/L	micrograms per liter
mg/kg	milligram(s) per kilogram
mg/L	milligrams per liter
MP	monitoring point
NDEQ	Nebraska Department of Environmental Quality
NFRAP	no further response action planned
PAH	polynuclear aromatic hydrocarbon
Parsons ES	Parsons Engineering Science, Inc.
PID	photoionization detector
ppmv	parts per million, volume per volume
QA	quality assurance
QC	quality control
RAC	Remedial Action Class
RBCA	risk-based corrective action
RBSL	risk-based screening level
SAC	Strategic Air Command
SAP	Sampling and Analysis Plan
SSL	soil screening level
TRPH	total recoverable petroleum hydrocarbon

TVH	total volatile hydrocarbons
TVHA	total volatile hydrocarbon analyzer
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
VW	vent well
yr	year

SECTION 1

INTRODUCTION

This confirmation sampling and analysis plan (SAP) has been prepared by Parsons Engineering Science, Inc. (Parsons ES), [formerly Engineering-Science, Inc. (ES)], for submittal to the US Air Force Center for Environmental Excellence (AFCEE), Brooks Air Force Base (AFB), Texas, and 55 Civil Engineering Squadron/Environmental Division (CES/CEVR), Offutt AFB, Nebraska. The SAP is intended to guide confirmation soil sampling at Building 406 at Offutt AFB, Nebraska. Building 406 is the location of a release of jet propulsion grade 4 (JP-4) jet fuel from a former underground storage tank (UST) system.

Since 1992, Offutt AFB has participated in two AFCEE-sponsored bioventing projects; currently, the Extended Bioventing Project, and formerly, the Bioventing Pilot Test Initiative. The Bioventing Pilot Test Initiative included conducting more than 135 *in situ* bioventing pilot tests at 48 Air Force installations nationwide. These tests were designed to collect data on the effectiveness of bioventing for the remediation of soil contaminated with fuel hydrocarbons (e.g., JP-4 jet fuel, diesel fuel, gasoline, or heating oil). As part of this project, bioventing pilot tests were conducted at the Low-Point Drain site (Building 528), Building 30, the Petroleum, Oils, and Lubricants site, and Building 406 at Offutt AFB.

The purpose of the pilot test at Building 406 was to evaluate the effectiveness of bioventing in remediating unsaturated soils contaminated with petroleum hydrocarbons that resulted from JP-4 released from the former USTs. The underground storage tanks (USTs) were removed in October 1993 (Terracon Environmental, Inc., 1993). Based on the results of the extended bioventing test, *in situ* bioventing appears to have reduced petroleum hydrocarbon contamination in site soils sufficiently to meet Nebraska Department of Environmental Quality (NDEQ) requirements for closure of the site. This SAP presents a plan for confirmation soil sampling to document the effectiveness of remediation of hydrocarbon contaminated soils at the Building 406 site.

The objective of the confirmatory soil sampling is to support an Air Force no-further-response-action-planned (NFRAP) decisions for the soils and groundwater impacted by JP-4 in the immediate vicinity of the former USTs, pursuant to closure of the Building 406 site. The confirmatory soil sampling effort is being performed as part of the AFCEE Extended Bioventing project.

This SAP consists of 10 sections, including this introduction. Section 2 includes site description, history, and summaries of previous investigations and remediation activities. Section 3 summarizes site closure requirements. A detailed sampling and

analysis strategy is presented in Section 4. Analytical results will be presented in a confirmation soil sampling report, as described in Section 5. Section 6 is a waste management plan for investigation-derived waste generated during drilling and sampling activities. Section 7 lists Offutt AFB support requirements, and Section 8 presents the proposed project schedule. Points of contact are provided in Section 9, and the references cited are provided in Section 10.

SECTION 2

SITE DESCRIPTION

Offutt AFB is located immediately south of Bellevue, Nebraska, approximately 10 miles south of Omaha. In 1896, Fort Crook was established at the location of the Base and became Offutt Field in 1924. In January 1948, Offutt Field was transferred to the Department of the Air Force and became Offutt AFB. The Base was the Strategic Air Command (Strategic Air Command) Headquarters from 1948 until 1992, when it became the 55th Wing of the Air Combat Command.

2.1 SITE LOCATION AND HISTORY

Building 406 was a fuel pumphouse serving six large USTs, located just east of SAC Boulevard at the northeastern corner of the Base golf course. A layout of the Building 406 site is shown on Figure 2.1. Each of the six USTs at the site was reported to be 60 feet long and 12 feet in diameter with a capacity of 51,000 gallons. One of these tanks contained deicing fluid and the others contained JP-4 and (formerly) AVGAS. A seventh UST, located to the south (Figure 2.1) was reported to have contained fuel oil. This tank was 6 feet long, 4 feet in diameter, and had a capacity of 560 gallons (Terracon Environmental, Inc., 1993). The fuel pumphouse and associated tanks were taken out of service in March 1992.

Contaminated soil was observed during removal of the six large USTs in October 1993, and was reported to the Nebraska State Fire Marshal Flammable Liquid Storage Division and the NDEQ in the tank closure assessment report (Terracon Environmental, Inc., 1993). Contaminated soils removed during the tank removal project were returned to the excavations. No evidence of contamination was observed during removal of the fuel oil UST located to the south of the others. Investigations and remedial actions performed subsequent to UST removal are described in Section 2.3.

2.2 TOPOGRAPHY, HYDROLOGY, GEOLOGY, AND HYDROGEOLOGY

2.2.1 Topography and Surface Hydrology

Offutt AFB is located on a dissected Pleistocene terrace embankment and Missouri River Valley bottomland (Woodward Clyde Consultants, 1995). The Building 406 site is located on the Pleistocene terrace approximately 995 feet above mean sea level. Surface water in the vicinity of Building 406 is primarily controlled by the storm sewer system which drains to Papillion Creek. Papillion Creek is located 2,400 feet southwest of the site at its nearest point. The Missouri River is approximately 1 mile

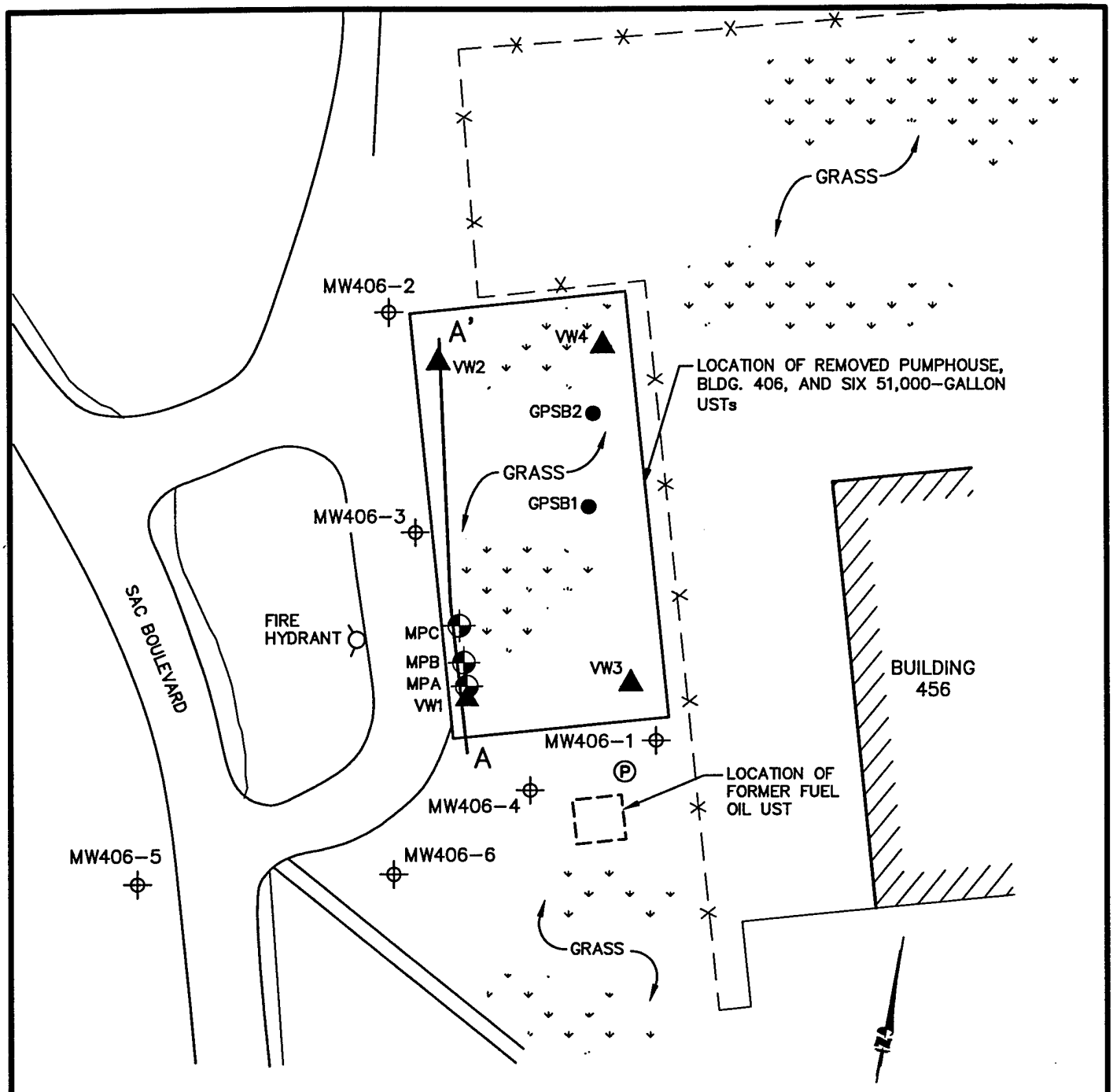

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FIGURE 2.1

SITE LAYOUT

Building 406
Offutt Air Force Base, Nebraska

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from the eastern boundary of the base and approximately 2.5 miles from the Building 406 site.

2.2.2 Geology

The Pleistocene terrace geologic profile is typically surficial fill; loess; Pleistocene terrace alluvial clays, silts, and sands; and a clay-rich glacial till-outwash sand complex overlying Pennsylvanian bedrock. The Pennsylvanian bedrock is primarily composed of limestone and shales (Woodward Clyde Consultants, 1995).

During installation of the bioventing pilot test components (described in Section 2.3.3), soil samples were collected and analyzed for grain-size distribution by a geotechnical laboratory. The soil beneath the Building 406 site is characterized by silt with some clay and a trace of sand to a depth of at least 25 feet below ground surface (bgs) (ES, 1994). These observations suggest that the former tanks were located within the surficial fill and loess deposits. Bedrock was not encountered during any investigation activities, all of which terminated at depths of 25 feet bgs or less. Figure 2.2 presents the hydrogeologic cross-section of the site. The trace of the cross section is shown on Figure 2.1.

2.2.3 Hydrogeology

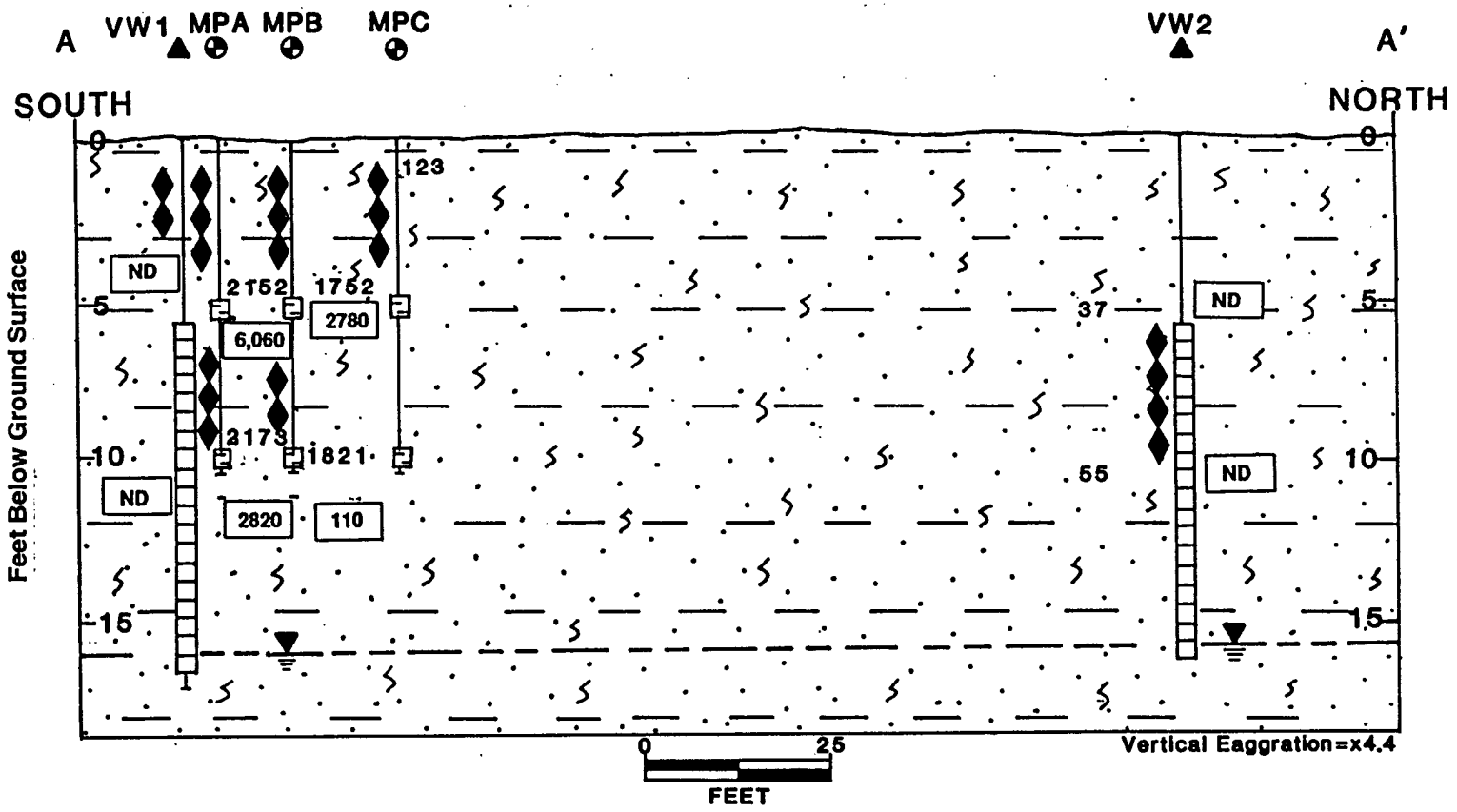
The unconsolidated material resting on the Pennsylvanian bedrock comprise the principal aquifer beneath the site. The clay-rich glacial till is considered an aquitard for the unconfined aquifer present in overlying Pleistocene alluvial deposits and loess (Woodward Clyde Consultants, 1995). The water table beneath the Building 406 site was present at a depth of approximately 17 to 20 feet bgs in February 1994, but was observed to be approximately 16 feet bgs during installation of the bioventing system in October 1993. Groundwater flow is to the west-southwest, as shown on Figure 2.3. Limited hydraulic conductivity data for the area indicate an alluvial aquifer conductivity of 0.0002 centimeters per second (Terracon Environmental, Inc., 1994). Assuming an average hydraulic gradient of 0.01 foot per foot (estimated from the 1994 groundwater elevation data) and a effective porosity of 0.40, the groundwater flow velocity is approximately 5 feet per year.

Groundwater is not currently used as a potable water source within Offutt AFB property. There are two abandoned groundwater production wells located on the Base, an emergency well (Well No. 9) in the underground command center at Facility 500, and an emergency standby fire protection well (Well No. 5) on the east side of the POL yard. Two domestic wells are located 2,000 feet south-southwest (downgradient) of the Base boundary (Woodward Clyde Consultants, 1995).

2.3 PREVIOUS INVESTIGATIONS

2.3.1 1993 Tank Removal

The seven USTs associated with Building 406 were removed, and a tank closure assessment was performed in October 1993 by Terracon Environmental, Inc., (1993). Upon removal, none of the tanks showed visible signs of leaks; however, contaminated



LITHOLOGIC DESCRIPTION

SILT WITH CLAY AND SAND

LEGEND

- MPA — MONITORING POINT
- VW1 — INJECTION VENT WELL
- 42 — FIELD SCREENING RESULTS FOR TOTAL VOLATILE HYDROCARBONS (ppmv)
- 42 — LABORATORY RESULTS FOR SOIL TOTAL PETROLEUM HYDROCARBONS (mg/kg)
- FUEL ODOR DETECTED DURING DRILLING
- GROUNDWATER ELEVATION (10/93)
- GEOLOGIC CONTACT, DASHED WHERE INFERRED
- MONITORING POINT SCREENED INTERVAL
- SCREENED WELL INTERVAL
- ND — NOT DETECTED

FIGURE 2.2

HYDROGEOLOGIC CROSS SECTION A-A'

Building 406
Offutt Air Force Base, Nebraska

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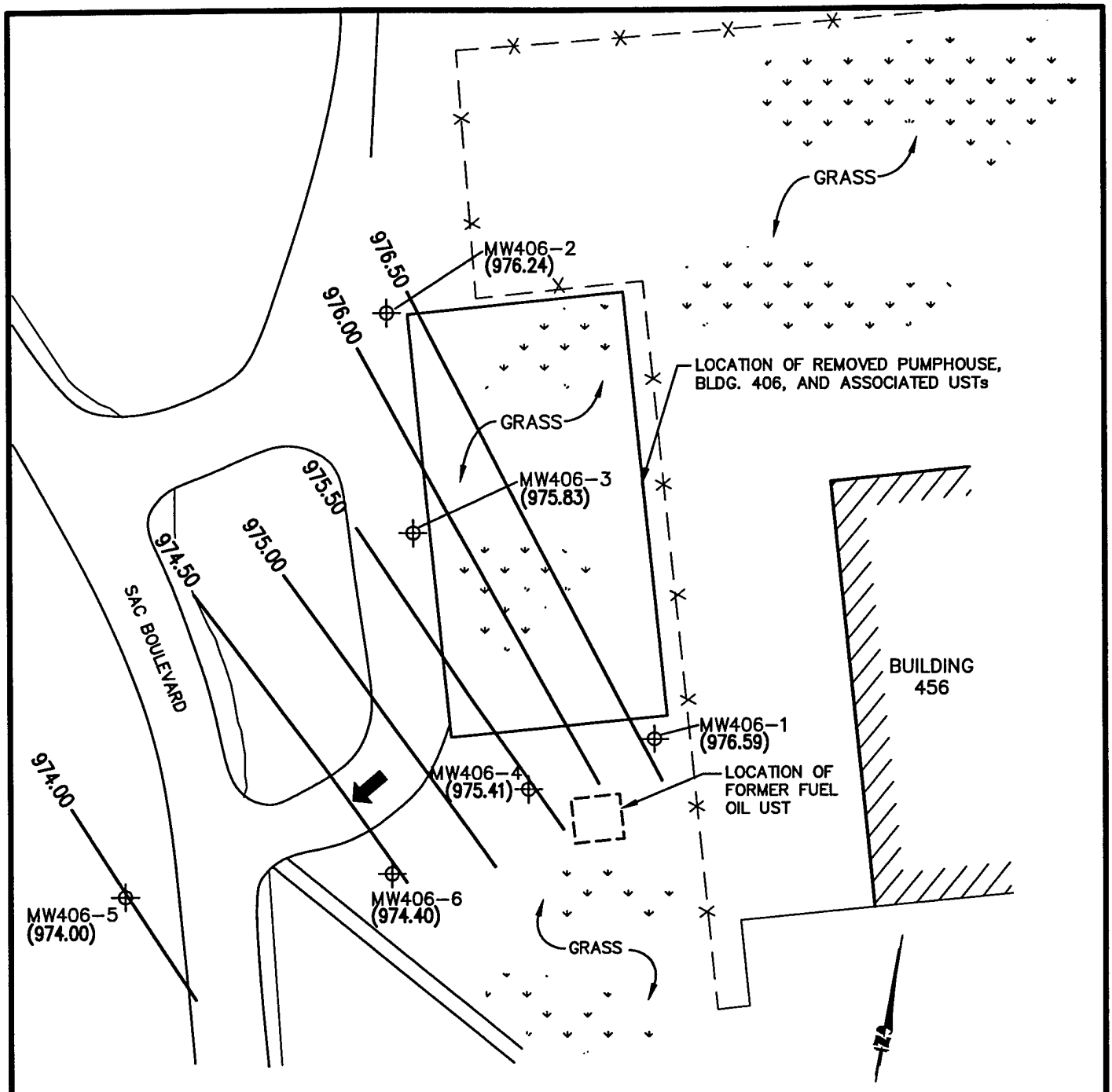

LEGEND

MW406-1 ⊕	MONITORING WELL
(976.59)	GROUNDWATER ELEVATION, FEBRUARY 1994 (feet above mean sea level)
- - ✕ - -	FENCE
⬅	GROUNDWATER FLOW DIRECTION
975.00 ——	LINE OF EQUAL GROUNDWATER ELEVATION (feet above mean sea level)

FIGURE 2.3

GROUNDWATER ELEVATIONS AND FLOW DIRECTION FEBRUARY 1994

Building 406
Offutt Air Force Base, Nebraska

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soils were observed in the removal excavation for the six 51,000-gallon USTs. Soils had a greenish color and a distinctive hydrocarbon odor. Composite soil sample headspace readings indicated total volatile hydrocarbons (TVH) in the range of 200 to 400 parts per million, volume per volume (ppmv). No indication of soil contamination was observed in the excavation for the 560-gallon fuel oil UST. Soil samples were collected from both excavations, and the analytical results are presented in Table 2.1 (Terracon Environmental Inc., 1993).

The excavation for the six larger tanks was at least 16 feet deep, allowing groundwater to accumulate. Groundwater samples were collected from the excavation and analyzed for total recoverable petroleum hydrocarbons (TRPH) by US Environmental Protection Agency (USEPA) Method 418.1 and for benzene, toluene, ethylbenzene, and total xylenes (BTEX) by USEPA Method SW8020. The groundwater analytical results are presented in Table 2.2.

2.3.2 1994 Groundwater Investigation

During a November 2, 1993 meeting, the NDEQ indicated that investigation of the nature and extent of groundwater contamination, if present, was required at Building 406. Terracon Environmental, Inc. (1994) installed six soil boreholes, and completed them as monitoring wells between August 27, 1993 and February 21, 1994. Figure 2.3 shows the locations of the monitoring wells.

During installation of the boreholes, soil samples were collected at 5-foot intervals and screened for volatile organic compounds (VOCs) using a photoionization detector (PID). The results, presented in Table 2.3, indicate that soils at wells MW406-1 and MW406-3 are contaminated near the groundwater surface, and that only at MW406-4 was there significant vadose zone contamination.

Groundwater samples were collected from each well between December 20, 1993 and February 21, 1994 and were analyzed for BTEX by USEPA Method SW8020 and TRPH by USEPA Method 418.1. The results, presented in Table 2.4, indicate minor impact to the groundwater in the immediate vicinity of the former tanks. No drinking water maximum contaminant levels (MCLs) were exceeded. No further groundwater investigation has been performed at this site.

2.3.3 1993-1997 Bioventing Pilot Test

In October 1993, a full-scale bioventing system was installed at the Building 406 site by ES (1994) as part of the AFCEE Bioventing Pilot Test Initiative Project. The Building 406 site at Offutt AFB was the first full-scale bioventing system installed in USEPA Region 7. Objectives of the pilot test were to inject air into the subsurface to supply native hydrocarbon degrading bacteria with oxygen, determine the rate at which the indigenous microorganisms would degrade fuel when stimulated by oxygen-rich soil gas, and to evaluate the potential for sustaining these rates of biodegradation until fuel contamination was remediated to concentrations below NDEQ standards.

TABLE 2.1
SOIL ANALYTICAL RESULTS FROM TANK REMOVAL EXCAVATIONS
BUILDING 406
OFFUTT AIR FORCE BASE, NEBRASKA

Sample ID	Depth Sampled (feet bgs[c/])	Sample Location	Volatile Organic Compounds SW8020				Total BTEX[b/] (mg/kg)	TRPH[a/] EPA 418.1 (mg/kg)
			Benzene (mg/kg)[d/]	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Total Xylenes (mg/kg)		
1T	15	north excavation	1.6 U[e/]	1.6 U	4.3	2.6	6.9	400
2T	15	north excavation	0.005 U	0.005 U	0.048	0.124	0.172	22
3T	15	north excavation	0.160 U	0.190	1.2	19.0	20.4	690
4T	15	north excavation	0.2 U	0.3	1.1	0.6	2.0	130
#7 T1	6	south excavation	NA[f/]	NA	NA	NA	NA	47
#7 2T	6	south excavation	NA	NA	NA	NA	NA	89

Source: Terracon Envrionmental, Inc., 1993.

[a/] TRPH = Total recoverable petroleum hydrocarbons.

[b/] BTEX = Benzene, toluene, ethylbenzene, and total xylenes.

[c/] bgs = Below ground surface.

[d/] mg/kg = Milligrams per kilogram.

[e/] U - Indicates compound was analyzed for but not detected. Sample quantitation limit shown.

TABLE 2.2
TANK EXCAVATION GROUNDWATER ANALYTICAL RESULTS
BUILDING 406
OFFUTT AIR FORCE BASE, NEBRASKA

Sample ID	Date Sampled BTEX[b/]	Date Sampled TRPH	Volatile Organic Compounds SW8020 Benzene (µg/L)[c/]	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	Total BTEX (µg/L)	TRPH[a/] EPA 418.1 (mg/L)[d/]
T-1	9/21/93	9/21/93	3,700	500	2,500	3,100	9,800	15
T-2	9/20/93	9/20/93	3,900	200 U[e/]	2,400	1,700	8,000	150
T-3	9/17/93	9/17/93	1,900	200 U	1,000	1,300	4,200	3.4
T-5	9/24/93	9/24/93	9.0	42	10	130	191	1.0 U
T-6	9/23/93	9/23/93	12	150	6.0	29		1.0 U

Source: Terracon Envrionmental, Inc., 1993.

a/ TRPH = Total recoverable petroleum hydrocarbons.

b/ BTEX = Benzene, toluene, ethylbenzene, and total xylenes.

c/ µg/L = Micrograms per liter.

d/ mg/L = Milligrams per liter.

e/ U - Indicates compound was analyzed for but not detected. Sample quantitation limit shown.

TABLE 2.3
FIELD SCREENING RESULTS FOR MONITORING WELL BOREHOLE SOIL SAMPLES
BUILDING 406
OFFUTT AIR FORCE BASE, NEBRASKA

Sample Depth (feet)	Field Screening Results (ppmv)[a/]					
	MW 406-1	MW 406-2	MW 406-3	MW 406-4	MW 406-5	MW 406-6
3.0 - 5.0	<1	<1	<1	310	3	<1
8.0 - 10.0	<1	<1	<1	410	2	<1
13.0 - 15.0	<1	<1	<1	79	4	<1
18.0 - 20.0	<1	<1	390	120	4	<1
22.0 - 23.0	510	<1	-[b/]	240	-	9

Source: Terracon Envrionmental, Inc., 1994.

[a/] Field screeing results obtained with a photoionization detector; ppmv = parts per million, volume per volume.

[b/] Borehole not advanced to reported depth.

TABLE 2.4
MONITORING WELL GROUNDWATER ANALYTICAL RESULTS
BUILDING 406
OFFUTT AIR FORCE BASE, NEBRASKA

Sample ID	Date Sampled		Volatile Organic Compounds SW8020				Total BTEX	TRPH[a/] EPA 418.1
	BTEX[b/]	TRPH	Benzene (µg/L)[c/]	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	(µg/L)	(mg/L)[d/]
MW 406-1	9/17/93	2/11/94	2 U[e/]	2 U	2 U	2 U	ND[f/]	1.0 U
MW 406-2	1/5/94	2/1/94	2 U	2 U	2 U	2.4	2.4	1.0 U
MW 406-3	12/20/93	2/1/94	2 U	4.0	5.2	21	30.2	1.0 U
MW 406-4	1/5/94	2/1/94	2 U	2.1	3.1	12	17.2	2.2
MW 406-5	1/7/94	2/1/94	2 U	2 U	2 U	3.1	3.1	1.0 U
MW 406-6	2/21/94	2/21/94	4 U	4 U	5.6	23	28.6	1.0 U
MCL[g/]	-	-	5	1,000	700	10,000	-	-

Source: Terracon Envrionmental, Inc., 1994.

a/ TRPH = Total recoverable petroleum hydrocarbons.

b/ BTEX = Benzene, toluene, ethylbenzene, and total xylenes.

c/ µg/L = Micrograms per liter.

d/ mg/L = Milligrams per liter.

e/ U - Indicates compound was analyzed for but not detected. Sample quantitation limit shown.

f/ ND = not detected

g/ MCL = maximum contaminant level (USEPA, 1996a)

The full-scale bioventing system consisted of four vent wells (VWs), three multi-depth vapor monitoring points (MPs), and a blower unit. Pilot testing activities performed during installation included respiration and air permeability testing and soil and soil gas sampling. The Bioventing Pilot Test Initiative Project provided for 1 year of system operation followed by soil gas sampling and respiration testing. However, the NDEQ, in cooperation with AFCEE, funded an additional year (year 2) of system operation followed by soil gas sampling and respiration testing. Following the second year of operation, additional soil samples were collected in October 1995 from two newly installed sampling locations (GPSB1 and GPSB2), as well as from the locations previously sampled.

Figure 2.4 shows the locations of the bioventing system components. As part of the investigation at the time of system installation, soil samples were collected at 5-foot intervals from all VW and MP boreholes. All soil samples were field screened with a PID, and 12 samples were analyzed for BTEX, TRPH, nutrients, moisture, and grain-size distribution analyses. Soil gas samples also were collected from VW1 and the 10-foot intervals of MPA and MPB and analyzed for BTEX and TVH. Based on field screening results, hydrocarbon contamination generally was present from about 5 to 16 feet bgs. Contaminated soils were encountered in all MP boreholes, with the greatest contamination occurring at 10 feet bgs at MPA.

Table 2.5 summarizes the BTEX and TRPH analytical results for the soil samples collected at the time of bioventing system installation, as well as for samples collected from these locations after years 1 and 2 of bioventing treatment. Results for samples collected from GPSB1 and GPSB2, first sampled during the 1-year sampling event, also are presented. The soil analytical results indicate that bioventing has significantly reduced BTEX concentrations in soils. TRPH concentrations decreased at nine sampling locations, increased at two locations, and remained constant (below laboratory detection limits) at five sampling locations during the first 2 years of bioventing. Apparent increases in TRPH concentrations are not uncommon because of the heterogeneity of soils which can result in selective TRPH adsorption characteristics and variability in TRPH analytical results. Overall, the soil analytical results indicate that bioventing has reduced TRPH and BTEX concentrations in soils at the Building 406 site (Table 2.5).

The Building 406 site was funded for a third year of operation and monitoring of the bioventing system under the Extended Bioventing Program. The funding included an additional year of system operation and testing (Option 1) and confirmation soil sampling (Option 2) to document the effectiveness of soil remediation at the site. The 1-year operation and maintenance support period under Option 1 began following the October 1995 (2-year) sampling event. Respiration testing and soil gas sampling were performed in November 1996 (3-year sampling event) following 1 month of system shut down to allow equilibrium conditions to develop in site soil vapors and to allow comparison to initial, 1-year, and 2-year analytical results. Soil sampling was not performed during the 3-year sampling event. The bioventing system has been operating since the November 1996 sampling event, except during short periods following blower unit failure. The blower was subsequently replaced.

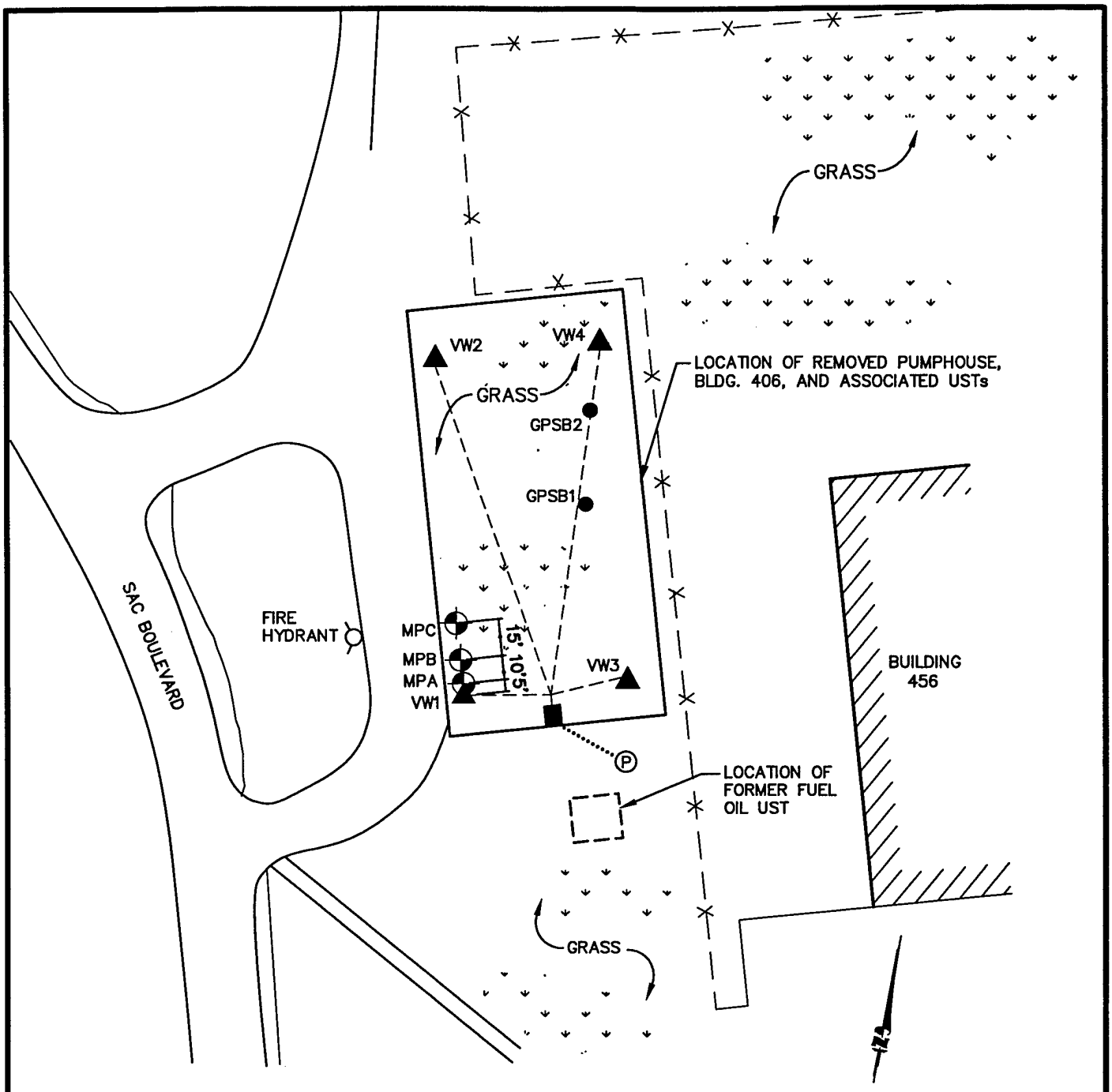

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FIGURE 2.4

AS-BUILT VENT WELL, MONITORING POINT, AND BLOWER LOCATIONS

Building 406
Offutt Air Force Base, Nebraska

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TABLE 2.5
INITIAL, 1-YEAR, AND 2-YEAR SOIL ANALYTICAL RESULTS
BUILDING 406
OFFUTT AIR FORCE BASE, NEBRASKA

Analyte (Units) [a]	Sample Locations-Depth (feet below ground surface)											
	VW1-5			VW1-10			MPA-5			MPA-10		
Soil Hydrocarbons	Initial [b]	1-Year [c]	2-Year [d/e]	Initial	1-Year	2-Year [e]	Initial	1-Year	2-Year	Initial	1-Year	2-Year
TRPH (mg/kg)	<8.0	<12.5	<50/<50	<6.5	<12.5	<50/<50	6,060	6,070	1,300	2,820	5,000	<50
Benzene (mg/kg)	<0.0020	<0.061	<0.10/<0.10	0.0073	<0.063	<0.10/<0.10	20	<0.061	<0.10	7.4	<0.056	<0.10
Toluene (mg/kg)	<0.0020	<0.061	<0.10/<0.10	0.0007	<0.063	<0.10/<0.10	<5	1.9	<0.10	5	5.5	<0.10
Ethylbenzene (mg/kg)	<0.0020	<0.061	<0.10/<0.10	0.0044	<0.063	<0.10/<0.10	270	<0.061	<0.10	78	<0.056	<0.10
Xylenes (mg/kg)	<0.0020	<0.12 [f]	<0.20/<0.20	0.007	<0.13	<0.20/<0.20	380	7.5	<0.20	130	14	<0.20
Moisture (%)	NS [g]	20.5	21.7/22.2	23	21.6	24.2/22.8	NS	19.5	22.0	23	11.5	23.9
	MPB-5			MPB-10			VW2-5			VW2-10		
Soil Hydrocarbons	Initial [b]	1-Year [c]	2-Year [d]	Initial	1-Year	2-Year	Initial	1-Year	2-Year	Initial	1-Year	2-Year
TRPH (mg/kg)	2,780	2,270	<50	110	223	<50	<8.0	<12.3	<50	<6.6	<12.9	<50
Benzene (mg/kg)	<1.0	<0.062	<0.10	1.2	<0.062	<0.10	<0.0020	<0.062	<0.10	<0.0006	<0.064	<0.10
Toluene (mg/kg)	<1.0	0.71	<0.10	0.58	<0.062	<0.10	<0.0020	<0.062	<0.10	0.0049	<0.064	<0.10
Ethylbenzene (mg/kg)	43	<0.062	<0.10	4.7	<0.062	<0.10	<0.0020	<0.062	<0.10	<0.0006	<0.064	<0.10
Xylenes (mg/kg)	49	0.51	<0.20	10	<0.12	<0.20	<0.0020	<0.12	<0.20	0.0052	<0.13	<0.20
Moisture (%)	NS	20.4	21.3	22	20.7	22.9	NS	19.5	20.9	24	22.2	23.9
	VW3-5			VW3-10			VW4-5			VW4-10		
Soil Hydrocarbons	Initial [b]	1-Year [c]	2-Year [d]	Initial	1-Year	2-Year	Initial	1-Year	2-Year	Initial	1-Year	2-Year
TRPH (mg/kg)	1,300	11,700	<50	94	19.3	390	600	30.3	<50	<6.5	<12.9	<50
Benzene (mg/kg)	<0.25	<0.062	<0.10	3.6	0.17	1.3	<0.50	<0.062	<0.10	<0.16	<0.064	<0.10
Toluene (mg/kg)	<0.25	0.97	<0.10	<3.1	0.13	<0.50	1.1	<0.062	<0.10	8.8	<0.064	<0.10
Ethylbenzene (mg/kg)	12	<0.062	0.16	8.6	<0.062	28	<0.50	<0.062	<0.10	0.52	<0.064	<0.10
Xylenes (mg/kg)	14	1.2	<0.20	22	0.17	48	1.2	<0.12	<0.20	2.5	<0.13	<0.20
Moisture (%)	NS	18.7	4.0	20	20.1	18.2	NS	20.3	21.1	23	22.5	21.4

TABLE 2.5, (CONTINUED)
INITIAL, 1-YEAR, AND 2-YEAR SOIL ANALYTICAL RESULTS
BUILDING 406
OFFUTT AIR FORCE BASE, NEBRASKA

Analyte (Units) [a]	Sample Locations-Depth (feet below ground surface)											
	GPSB1-5			GPSB1-10			GPSB2-5			GPSB2-10		
Soil Hydrocarbons	Initial [b]	1-Year [c]	2-Year [d]	Initial	1-Year	2-Year	Initial	1-Year	2-Year	Initial	1-Year	2-Year
TRPH (mg/kg)	NS	724	<50	NS	66	430	NS	1,150	100	NS	35.8	<50
Benzene (mg/kg)	NS	<0.063	<0.20	NS	0.097	<0.50	NS	<0.058	<0.10	NS	0.11	0.13
Toluene (mg/kg)	NS	0.80	<0.20	NS	1.6	<0.50	NS	1.3	0.13	NS	1.3	<0.10
Ethylbenzene (mg/kg)	NS	<0.063	5.2	NS	<0.063	8.1	NS	0.089	2.8	NS	<0.064	0.71
Xylenes (mg/kg)	NS	0.63	3.5	NS	0.280	4.0	NS	1.2	1.9	NS	3.9	1.1
Moisture (%)	NS	21.2	20.4	NS	20.9	20.4	NS	18.4	16.0	NS	22.3	19.1

[a] TRPH = total recoverable petroleum hydrocarbons analyzed by USEPA Method 418.1; benzene, toluene, ethylbenzene, and total xylenes analyzed by USEPA Method SW8020; mg/kg = milligrams per kilogram.
[b] Initial soil samples collected on October 20-22, 1993.
[c] 1-Year soil samples collected on October 11-12, 1994.
[d] 2-Year soil samples collected on September 28-29, 1995.
[e] Primary sample result/replicate sample result.
[f] Sample result as reported following 1-year sampling event was incorrect. Correct result is shown.
[g] NS = not sampled

Table 2.6 summarizes the oxygen, carbon dioxide, BTEX, and TVH results for the soil gas samples collected at the time of bioventing system installation and after 1, 2, and 3 years of bioventing treatment. All soil gas measurements shown are for soil gas at equilibrium, with the blower system not in operation. The laboratory data indicate reductions in TVH concentrations of between two and four orders of magnitude during the 3 years of bioventing. BTEX concentrations in soil gas have been reduced to nearly non-detectable levels.

Initial soil gas testing indicated depleted oxygen concentrations and high TVH concentrations at all 10-foot MP intervals and at VW-1. This suggested that air injection would oxygenate contaminated soils and enhance biodegradation of residual petroleum hydrocarbons by native aerobic soil microbes. The air permeability test indicated a radius of pressure influence of at least 30 feet, and an air permeability of 3.6 darcys.

In situ respiration tests were performed during pilot testing activities at the time of system installation. The results provided an oxygen utilization rate from which fuel hydrocarbon biodegradation rates were estimated. Based on the initial respiration testing event, fuel biodegradation rates ranging from 1,000 to 24,000 mg of fuel per kg of soil per year (mg/kg/yr) were estimated. Respiration tests were also performed during 6-month, 1-year, 18-month, 2-year, and 3-year testing events. The results of the follow up respiration tests, shown in Table 2.7, indicate that significant reductions in oxygen utilization and fuel biodegradation rates have occurred as a result of bioventing system operation. Oxygen utilization and fuel biodegradation rates typically decrease with continued bioventing as the lighter, more readily biodegraded hydrocarbons are preferentially degraded over more biologically recalcitrant, higher-molecular-weight hydrocarbons. The BTEX compounds, as demonstrated by the soil gas results (Table 2.6), have been almost completely biodegraded.

The details of the bioventing system installation and preliminary pilot test and analytical results are presented in the bioventing pilot test work plan and draft interim pilot test results report (ES, 1994). The 1-year, 2-year, and 3-year test results are summarized in a 30 January 1995 letter (Parsons ES, 1995), a 25 February 1996 letter (AFCEE, 1996), and a 29 January, 1997 (Parsons ES, 1997), respectively.

2.3.6 Results Summary

Based on the results of the previous investigations, the former JP-4 USTs have been identified as the probable source of the petroleum hydrocarbon contamination at the Building 406 site. Investigation results indicate that the majority of the vadose zone contamination has been limited to the soils near the former USTs. Field screening of soil samples collected during installation of the monitoring wells indicated that vadose zone soils beyond the limits of the UST excavation have not been significantly impacted (Table 2.1). Therefore, the majority of the vadose zone contamination is within the bioventing system treatment area (Figure 2.4). Results of the bioventing testing indicate that significant reductions in soil TRPH and BTEX concentrations have occurred as the result of bioventing (Tables 2.5 and 2.6). In addition, fuel biodegradation rates have decreased as fuel hydrocarbon concentrations decrease;

TABLE 2.6
SOIL GAS FIELD AND LABORATORY ANALYTICAL RESULTS
BUILDING 406
OFFUTT AIR FORCE BASE, NEBRASKA

Sampling Location[a]	Sampling Event[b]	Field Screening Data: Oxygen (percent)	Field Screening Data: Carbon Dioxide (percent)	Field Screening Data: TVH (ppmv)[c]	Laboratory Analytical Results[d]: TVH (ppmv)	Benzene (ppmv)	Toluene (ppmv)	Ethylbenzene (ppmv)	Xylenes (ppmv)
VW1	Initial	1.5	9.8	9,400	14,000	200	<1.1[e]	41	41
	1-Year	—[f]	—	—	460	<0.027	<0.027	1.7	6.8
	2-Year	10.5[g]	0.1[g]	12[g]	2.8	0.008	0.003	<0.003	0.009
	3-Year	16.2	0.1	30	6.5	0.004	0.022[h]	0.03	0.28[h]
MPA-5	Initial	20.0	0.4	1200	—	—	—	—	—
	3-Year	4.9	4.0	600	—	—	—	—	—
MPA-10	Initial	0.0	11.5	>20,000[i]	15,000	290	<2.2	50	60
	1-Year	—	—	—	4,900	<0.055	<0.055	13	62
	2-Year	2.1[g]	0.8[g]	290[g]	1,500	0.09[h]	2.8[h]	<0.064	6.3
	3-Year	0.0	2.3	2,400	860	<0.026	0.27	<0.026	4.5[h]
MPB-5	Initial	18.5	1.8	1,800	—	—	—	—	—
	3-Year	0.0	6.2	1,600	—	—	—	—	—
MPB-10	Initial	0.5	10.5	>20,000	26,000	370	<2.2	40	52
	1-Year	—	—	—	1,400	<0.053	<0.053	4.9	14
	2-Year	0.0[g]	1.0[g]	64[g]	310	0.57	0.6	<0.011	<0.011
	3-Year	0.0	2.5	5,000	94	<0.005	0.21	<0.005	0.30[h]
MPC-5	Initial	16.5	3.1	2,300	—	—	—	—	—
	3-Year	1.0	14.0	2,000	—	—	—	—	—
MPC-10	Initial	0.0	10.8	7,300	—	—	—	—	—
	1-Year	—	—	—	—	—	—	—	—
	2-Year	2.5[g]	2.8[g]	3,800[g]	—	—	—	—	—
	3-Year	3.2	14.2	2,800	—	—	—	—	—

[a] Sample location identifies the monitoring point and depth in feet below ground surface.
[b] Soil gas sampling performed in October 1993, October 1994, October 1995, and November 1996
[c] TVH=total volatile hydrocarbons: ppmv = parts per million, volume per volume.
[d] Soil gas analysis performed using USEPA Method TO-3.
[e] < = analyte concentration in sample was less than the method detection limit showwn.
[f] — = not analyzed.
[g] 2-year field screening results are the last respiration test data available for this location.
[h] Laboratory reported value may be biased due to apparent matrix interferences.
[i] > = measurement exceeded maximum reading for GasTech Trace-Techtor Hydrocarbon Analyzer.

022/726876/OFFUTT/2.XLS/TAB 2.6

TABLE 2.7
RESPIRATION AND DEGRADATION RATES
BUILDING 406
OFFUTT AIR FORCE BASE, NEBRASKA

Location-Depth (feet below ground surface)	Initial (October 1993)			6-Month (April 1994) [b/]			1-Year (October 1994)		
	K_o (% O_2/hour)	Degradation Rate (mg/kg/year)[a/]	Soil Temperature (°C)	K_o (% O_2/hour)	Degradation Rate (mg/kg/year)	Soil Temperature (°C)	K_o (% O_2/hour)	Degradation Rate (mg/kg/year)	Soil Temperature (°C)
VW	2.9	6,900	NS [c/]	NC	NC	NS	NC	NC	NS
MPA-5	NC [d/]	NC	14.7	NC	NC	9.3	NC	NC	21.4
MPA-10	10.2	24,000	15.9	0.22	910	11.2	0.35	2,200	20.7
MPB-10	0.40	1,000	NS	0.23	630	NS	0.32	940	NS
MPC-10	9.0	23,000	NS	0.55	1,500	NS	0.12	350	NS

Location-Depth (feet below ground surface)	18-Month (April 1995)[e/]			2-Year (September 1995)			3-Year (November 1996)[f/]		
	K_o (% O_2/hour)	Degradation Rate (mg/kg/year)	Soil Temperature (°C)	K_o (% O_2/hour)	Degradation Rate (mg/kg/year)	Soil Temperature (°C)	K_o (% O_2/hour)	Degradation Rate (mg/kg/year)	Soil Temperature (°C)
VW	NS	NS	NS	0.07	160	NS	0.04	99	NS
MPA-5	NS	NS	10.0	NC	NC	23.1	NS	NS	NS
MPA-10	0.28	1,000	12.1	0.84	1,600	20.5	0.52	970	NS
MPB-10	0.12	290	NS	0.27	600	NS	0.21	460	NS
MPC-10	0.10	230	NS	1.5	3,300	NS	1.4	3,100	NS

[a/] Milligrams of hydrocarbons per kilogram of soil per year.
[b/] Assumes moisture content of the soil is average of initial and 1-year moistures.
[c/] NS = Not sampled.
[d/] NC = Not calculated.
[e/] Assumes moisture content of the soil is the average of the 1-year and 2-year moistures.
[f/] Assumes moisture content of the soil the same as 2-year moistures.

however, significant rates of fuel biodegradation degradation were observed during the 3-year testing event (Table 2.7).

Analytical results of groundwater samples indicate minor impacts on the groundwater in the immediate vicinity of the former tanks (Tables 2.2 and 2.4). No drinking water MCLs were exceeded by the BTEX compounds detected in groundwater. Based on conversations with the NDEQ, no further groundwater investigation is required at this site (Nancy Mann, 1997).

SECTION 3

SITE CLEANUP REQUIREMENTS

3.1 SITE CHARACTERIZATION REQUIREMENTS

The objective of the confirmatory soil sampling is to support an NFRAP recommendation for the soils contaminated by jet fuel in the immediate vicinity of the former JP-4 USTs, pursuant to closure of the Building 406 site. This sampling plan targets only unsaturated soils within the former excavation as these are the soils for which the NDEQ requested remediation (i.e., the contaminated soils were returned to the excavation). Sampling of soils beyond the excavation limits and sampling of groundwater are not required.

3.2 STATE SOIL CLEANUP STANDARDS

NDEQ (1991) determines soil and groundwater cleanup levels on a case-by-case basis, depending on site conditions. Cleanup standards are dependent on the beneficial use classification of the aquifer impacted or potentially impacted by soil petroleum hydrocarbon contamination. A remedial action class (RAC) is defined for pollution occurrences in three types of groundwater (or overlying soils), depending on the degree of (or potential for) use of the groundwater as a drinking water. The extent of remedial action required differs depending on the RAC of the contaminated (or likely to be contaminated) groundwater.

Definitions of the three RACs are summarized below (NDEQ 1991).

RAC-1 includes petroleum contamination of:

- Groundwaters currently being used as a public and/or private drinking water supply;
- Groundwaters intended to be used in a public drinking water system; or
- Groundwaters within 500 feet of a private drinking water-supply well.

RAC-2 includes petroleum contamination of:

- Groundwaters not now directly used as drinking water, but having the potential to be used in the future.

RAC-3 includes, but is not limited to, petroleum contamination of:

- Groundwaters not used, and unlikely to be used, as drinking water.

Factors that may result in a RAC-3 classification include:

- Poor natural quality of the groundwater, making it unfit for human consumption;
- Poor aquifer yields; and
- Past and present intensive land use including areas of industrial development or densely populated areas where groundwater is likely to be contaminated or will not be used as drinking water.

The Building 406 site has been classified as a RAC-3 occurrence. Typically the only remedial action required for a RAC-3 occurrence is removal of readily removable contaminants (i.e., free product). However, because contaminated soils were returned to the excavation following removal of the USTs, the NDEQ requested remedial action for these soils. Specific soil cleanup levels have not been defined for this site, and the NDEQ is not requiring further groundwater investigation (Nancy Mann, 1997).

3.3 PROPOSED SOIL CLEANUP GOALS

The American Society for Testing and Materials (ASTM, 1995) has developed a tiered, risk-based corrective action (RBCA) approach for petroleum-hydrocarbon-contaminated sites. This iterative approach allows first for screening of contaminant concentrations against generic risk-based concentrations, followed (if necessary) by the development of site-specific cleanup criteria based on an analysis of site data and receptors that could potentially be exposed to chemical contamination at, or downgradient from, the release site. In the absence of state soil clean up goals, Parsons ES and Offutt AFB will reference the ASTM RBCA standard for soil cleanup standards. Because RBCA criteria are based on current or foreseeable land uses and human receptor exposure scenarios, a review of available information is provided below.

3.3.1 Land Use and Potential Receptors

Current land use adjacent to the site is predominantly industrial, although the Base golf course is located to the east of (and upgradient from) the site. Future land for the Building 406 site and adjacent land will continue to be predominantly industrial. Based on the future industrial land use assumption and the site description presented in Section 2, current and future onsite workers are likely to represent the primary human receptor population. No ecological receptors are likely to be exposed to contaminants in site media under current or anticipated future land uses.

Groundwater within Offutt AFB property is not currently used as a potable water source; Moreover, site groundwater impacts from the JP-4 releases are minimal (Tables 2.2 and 2.4). Therefore, exposure of onsite and off-site human receptors to site contaminants through ingestion of, inhalation of, or dermal contact with contaminants in groundwater extracted for potable use is unlikely. More likely exposure pathways include VOC volatilization and migration into outdoor air or buildings, and incidental

ingestion of or dermal contact with surficial soil. Volatilization of fuel hydrocarbons from soil and vapor migration into onsite or off-site structures is expected to be the most significant potential exposure pathway resulting from contamination at the Building 406 site. This exposure pathway generally results in the lowest screening levels, and is therefore the most conservative of the potential exposure pathways.

3.3.2 Cleanup Goals

The ASTM (1995) RBCA standard risk-based screening levels (RBSLs) for soil, presented in a look-up table, are utilized in the Tier 1 evaluation of site contaminant concentrations. The RBSLs are not intended as cleanup goals but serve as conservative values against which to compare site contaminant concentrations. If site contaminant concentrations are lower than the RBSLs, then the RBCA standard suggests that no further corrective action is required. If site contaminant concentrations exceed the RBSLs, then site-specific target levels (SSTLs) can be developed through a Tier 2 evaluation.

BTEX and other common petroleum contaminant (e.g., polynuclear aromatic hydrocarbon [PAH]) concentrations in soil at Building 406 will be determined from the soil samples (to be collected and analyzed in accordance with Section 4), in order to compare these values with ASTM RBSLs. If the detected site contaminant concentrations do not exceed the most stringent RBSLs, the compounds will not be considered chemicals of potential concern (COPCs), and will not be retained for further Tier 2 evaluation. Under these circumstances, no additional remediation would be warranted for such compounds in order to protect potential receptors. If a detected site contaminant exceeds the appropriate RBSL, the compound is identified as a COPC and retained for further quantitative fate and transport and risk analyses.

For the purpose of comparison, generic RBSLs for commercial/industrial land use and maximum TRPH and BTEX soil concentrations detected during previous site investigations (Section 2.3) are presented in Table 3.1. The generic screening-level concentrations from the ASTM (1995) *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* and the USEPA (1996b) *Soil Screening Guidance: Technical Background Document* are presented. As previously mentioned, volatilization of hydrocarbon contaminants from soil resulting in vapor migration to buildings is likely to represent the most significant contaminant migration and potential receptor exposure pathway represented by hydrocarbon-contaminated soils at the Building 406 site. As can be seen in Table 3.1, the only detected soil contaminant exceeding its ASTM (1995) RBSL or USEPA (1996b) soil screening level (SSL) is benzene found in a sample collected in October 1993.

TABLE 3.1
SOIL CONTAMINANT LEVELS COMPARED TO SCREENING LEVELS
BUILDING 406
OFFUTT AIR FORCE BASE, NEBRASKA

	Units[c]	Detected Site Maximum Concentration	Date	ASTM[a] Comm/Indus Soil Vapor Intrusion RBSL[d]	USEPA[b] Ingestion SSL	USEPA[b] Inhalation SSL
TRPH	mg/kg	11,700	October 1994	NA[e]	NA	NA
Benzene	mg/kg	20	October 1993	0.0109	22	0.8
Toluene	mg/kg	8.8	October 1993	54.5	16,000	650
Ethylbenzene	mg/kg	270	October 1993	1,100	7,800	400
Xylenes	mg/kg	380	October 1993	RES[f]	160,000[g]	410[g]
Naphthalene	mg/kg	---[h]	NA	107	3,100	NA

Note: The corrective action limits or target concentrations exceeded by the maximum site concentration detected are shown in gray.

[a] Risk-based screening levels (RBSLs) from Table X2.1 (ASTM, 1995).

[b] Generic soil screening levels (SSLs) from Table A-1 (USEPA, 1996).

[c] mg/kg = milligrams per kilogram.

[d] Values shown represent example Tier 1 Risk-Based Screening Levels (RBSLs) for commercial/industrial receptor scenario considering soil-vapor intrusion from soil onto buildings (ASTM, 1995).

[e] Target concentrations not available in the sources referenced.

[f] RES = Selected risk level is not exceeded for pure compound present at any concentration (ASTM, 1995).

[g] SSL data provided is for *o*-xylene, which has the most conservative SSLs of the three xylene isomers.

[h] --- = no site data yet available for this analyte.

SECTION 4

SITE CONFIRMATION SOIL SAMPLING AND ANALYSIS PLAN

This section describes the borehole locations, sampling depths, soil sampling procedures, and analytical methods proposed to collect sufficient data to verify remediation of Building 406 site soils and to support site closure. As described in Section 2, the Building 406 site was characterized during investigations in 1993 and 1994. In addition, analytical results from limited soil sampling conducted following 1 and 2 years of bioventing indicated substantial reductions in soil BTEX and TRPH concentrations.

Analytical results from groundwater samples collected between December 1993 and February 1994 indicate that the JP-4 releases at the Building 406 site have had minimal impact on groundwater. Although BTEX compounds were detected in five of the six wells, and TRPH was detected in one of the wells, detected concentrations were well below drinking water MCLs (Table 2.4). No free product was detected in any of the groundwater wells and was not observed in the tank removal excavations. Because these results indicate that groundwater has not been significantly impacted, and because the site is classified as a RAC-3 site, no further groundwater investigation is required. Therefore, groundwater sampling will not be performed as part of the closure sampling effort.

The pilot-scale bioventing system will operate until the Parsons ES team arrives onsite to perform the confirmation soil sampling event. The blower system will be turned off prior to the collection of soil samples. After soil sampling has been completed, the blower system will be started and reoptimized. The blower system should continue to operate until an NFRAP decision has been made and site closure has been approved by the NDEQ.

4.1 DRILLING, SAMPLING, AND EQUIPMENT DECONTAMINATION PROCEDURES

Six boreholes will be advanced and sampled in the vicinity of the former UST at the approximate locations shown on Figure 4.1. Samples will be collected at two depths (5 and 10 feet bgs) from each borehole. The locations chosen represent the locations sampled during bioventing system installation and the 1- and 2-year sampling events with the exception of VW-1 and VW-2. These locations were omitted because significant concentrations of TRPH or BTEX have not been detected at these locations during previous sampling events. Soil samples will be collected using a truck-mounted, hydraulically powered Geoprobe® percussion/probing machine capable of advancing sampling tools through unconsolidated soils. The Geoprobe® system provides for the rapid collection of soil samples at shallow depths while minimizing the generation of investigation-derived waste materials.

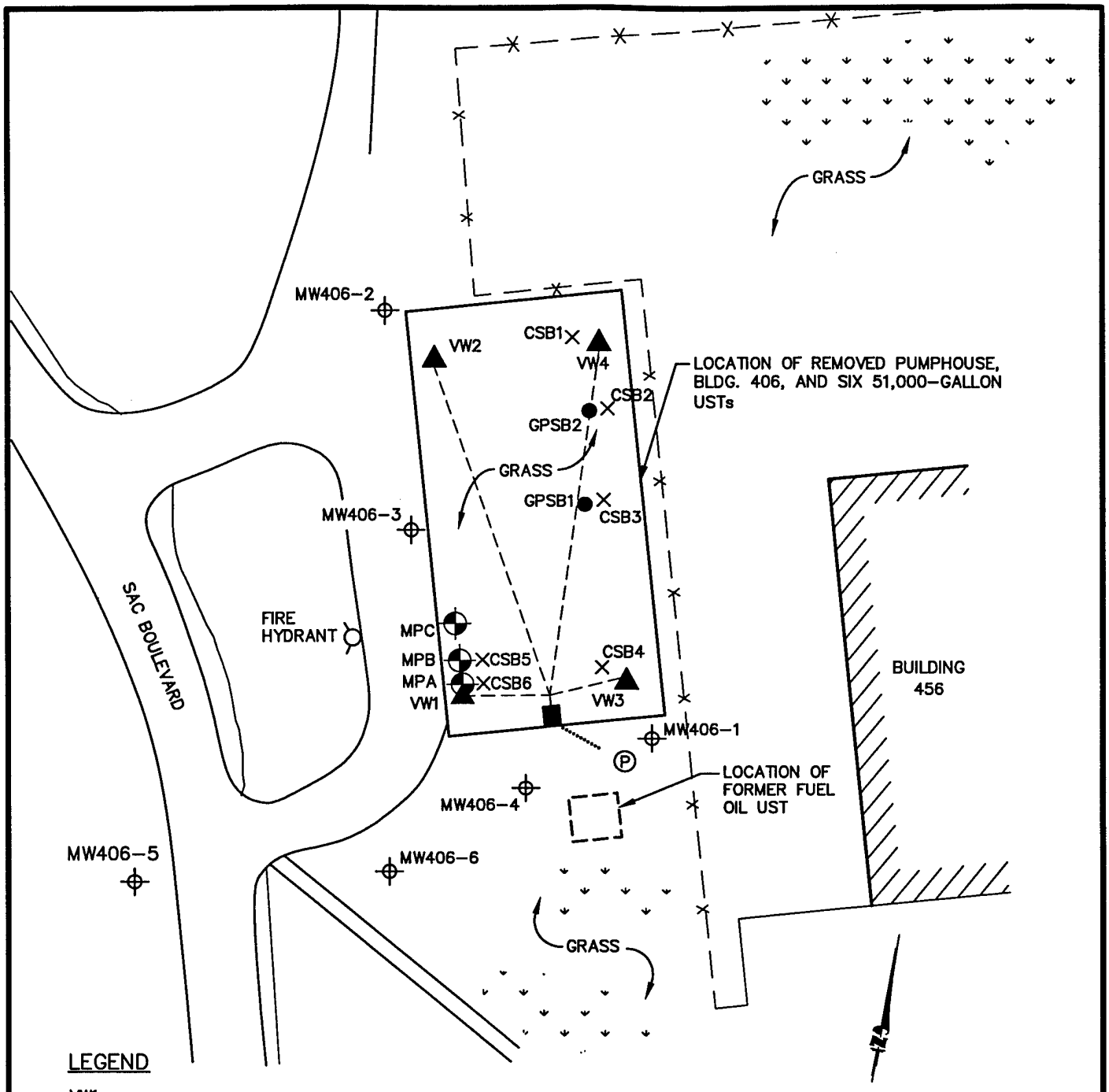

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FIGURE 4.1

PROPOSED SOIL SAMPLING LOCATIONS

Building 406
Offutt Air Force Base, Nebraska

PARSONS ENGINEERING SCIENCE, INC.

Denver, Colorado (303) 831-8100

Soil samples will be collected using a probe-drive sampler. The probe-drive sampler serves as both the driving point and the sample collection device and is attached to the leading end of the probe rods. To collect a soil sample, the sampler is pushed or driven to the desired sampling depth, the drive point is retracted, to open the sampling barrel, and the sampler is subsequently pushed into the undisturbed soils. The soil cores are retained within clear acetate liners inside the sampling barrel. The probe rods are then retracted, bringing the sampling device to the surface. The soil sample can then be extruded from the liners for lithologic logging, or the liners can be capped, and the undisturbed samples can be submitted to the analytical laboratory for testing. Soil samples will be screened with a PID or a total volatile hydrocarbon analyzer (TVHA).

Samplers, drive rods, and other downhole equipment will be cleaned before use and between boreholes to prevent cross-contamination. All downhole equipment will be washed with Alconox® detergent and rinsed with tap water. Between sampling events, the probe-drive sampler will be cleaned with Alconox®, followed by successive potable and distilled water rinses.

Boreholes will be drilled to 10 feet bgs. Soil samples will be collected at the 5- and 10-foot intervals at each sampling location. All soil samples will be visually examined and field analyzed using a PID or TVHA. The acetate liners containing the sample will be cut into 6-inch sections, and the ends of the sections will be screened with a PID or TVHA. The most contaminated interval of each sample, based on field screening results, will be submitted for laboratory analysis of TRPH, BTEX, and PAHs (see Section 4.2). In preparation for laboratory submittal, the ends of the selected section will be covered with Teflon® sheets and plastic end caps. The samples will be labeled with the site name and borehole number, sample depth, date of collection, project name, and other pertinent data. The samples will be sealed in plastic bags and immediately placed in an insulated cooler containing ice. The soil samples will be maintained in a chilled condition until delivered to the analytical laboratory. Chain-of-custody records will be prepared in the field and will accompany the samples to the analytical laboratory.

The remaining samples will be used for geologic logging. The data obtained from logging and headspace screening will be recorded on the borehole logs. Boreholes will be logged by a Parsons ES geologist. Soil types will be classified according to the Unified Soil Classification System (USCS) and described in accordance with the standard Parsons ES soil description format.

Following sampling, boreholes will be abandoned using granular bentonite. The granular bentonite will be placed in 3-foot lifts and hydrated to ensure complete hydration. The upper 1 foot of each borehole will be filled with excess soil sample.

4.2 SOIL SAMPLE ANALYSIS

All samples will be analyzed by an AFCEE-approved laboratory. Parsons ES proposes to analyze samples from the Building 406 site for TRPH by USEPA Method 418.1, for BTEX by USEPA Method SW8020, and for PAHs by USEPA Method SW8310. Quality control (QC) samples also will be collected and analyzed to assess

field and laboratory methods. The laboratory will perform analyses on one matrix spike and matrix spike duplicate (MS/MSD) sample for each specific analytical method requested, and one field trip blank per cooler for BTEX.

SECTION 5

SITE CONFIRMATION SAMPLING REPORT FORMAT

Following receipt of the laboratory analytical results, a draft confirmation soil sampling report will be prepared and submitted to 55 CES/CEVR and AFCEE.

The report will contain the following information for the former UST site:

- Plot plans showing final borehole locations;
- Summary of field activities;
- Assessment of analytical results in comparison to RBSLs and previous sampling results;
- Development of SSTLs for those contaminants detected at concentrations greater than the RBSLs;
- Laboratory analytical reports and chain-of-custody forms;
- Borehole logs; and
- Conclusions and recommendations for site closure or additional cleanup action.

Comments received from 55 CES/CEVR and AFCEE will be incorporated into a draft final report to be distributed to AFCEE, 55 CES/CEVR, and NDEQ.

SECTION 6

WASTE MANAGEMENT PLAN

This waste management plan applies only to the activities that will be performed for confirmation soil sampling at the Building 406 site at Offutt AFB. The investigation-derived waste (IDW) that will be generated during the confirmation sampling include both solid materials and wastewater produced from decontamination of sampling equipment.

Because the Geoprobe® system will be utilized to collect soil samples, minimal quantities of excess soil will be generated. The probe-sampling device generates no soil cuttings. The sampler is 18 inches long and 1.25 inches in diameter. Typically, 6 inches of the sample are sent to the laboratory for analysis. The remaining sample material will be used to fill the upper portion of the abandoned boreholes and/or spread on the ground surface at the site. The estimated total volume of excess soil sample is 0.01 cubic foot. Water generated during decontamination of sampling equipment also will be spread on the ground surface. An estimated 10 gallons of decontamination water will be generated.

SECTION 7

BASE SUPPORT REQUIREMENTS

The following Offutt AFB support is needed prior to the arrival of the Parsons ES sampling team:

- Assistance in obtaining drilling and digging permits;
- Arrangement of Base and site access for Parsons ES personnel; and
- Provision of a potable water supply for decontamination activities.

SECTION 8

PROJECT SCHEDULE

The following schedule is contingent upon approval of this SAP and fulfillment of Offutt AFB support requirements.

Event	Date
Submit Draft Confirmation SAP to AFCEE, 55 CES/CEVR, and NDEQ	28 July 1997
Receipt of AFCEE, 55 CES/CEVR, and NDEQ Comments	24 September 1997
Submit Final SAP to AFCEE, 55 CES/CEVR, and NDEQ	3 October 1997
Begin Confirmation Soil Sampling Field Activities	17 November 1997
Submit Draft Confirmation Soil Sampling Report to AFCEE and 55 CES/CEVR	26 January 1998
Receipt of AFCEE and 55 CES/CEVR Comments	23 February 1998
Submit Draft Final Confirmation Soil Sampling Report to AFCEE, 55 CES/CEVR, and NDEQ	16 March 1998

SECTION 9

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SECTION 10

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